Draft
March 2010

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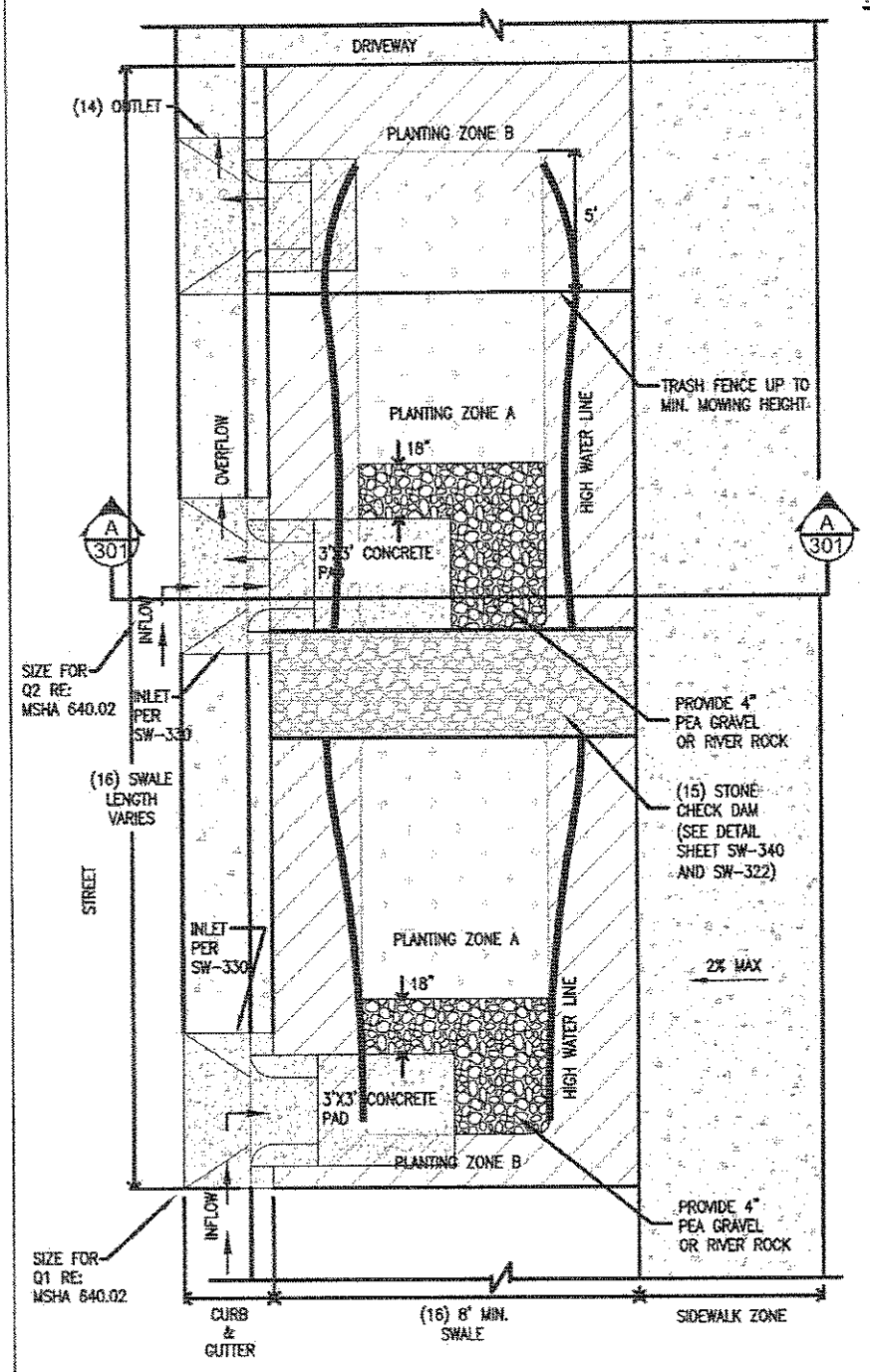
"Note: Details and specifications are adapted from 'Green Streets' details, City of Portland, Oregon."



PLAN

FOR SECTIONS REFER TO SW-301

NOTES:

1. Width of swale: eight (8) feet (min.) from inside face of curbs. Depth of swale: six (6) inches (min.) from inlet at gutter pan elevation to bottom of swale (see SW-301).
2. Longitudinal slope of swale should match road grade. Assume typical cross slope of the road to be 2-6% with a cross slope of the gutter pan to be 9.3%.
3. Special requirements may be necessary on steep slopes and for facilities designed NV.
4. Include beginning and ending station elevations for each facility. Provide the top and bottom elevation at each station called out for each facility. Include elevations of inlet and outlet.
5. Sidewalk elevation must be set above inlet and outlet elevations to allow overflow to drain to street rather than sidewalk.
6. See details SW-330, 331, and 332 for details.
7. Check dams required: See Sheet SW-340 for detail.
8. See MCDPS Biofiltraton Facility Specifications for Planting Media specifications.
9. Special requirements for water lines, meters, and fire hydrants: See sheet SW-302 and MSHA UD-3 for details.
10. Depending on conditions, utility lines may need to be sleeved.
11. Use standard MC-100.01 with gutter thickened to 12" for curb and gutter.
12. Install washed pea gravel or river rock to transition from splash pad to topsoil.
13. IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate existing utilities prior to beginning design.
14. Add concrete pad if swale bed is ≥ 2in below the gutter elevation.
15. See plan for location of check dams.
16. See plan for dimension of swale.

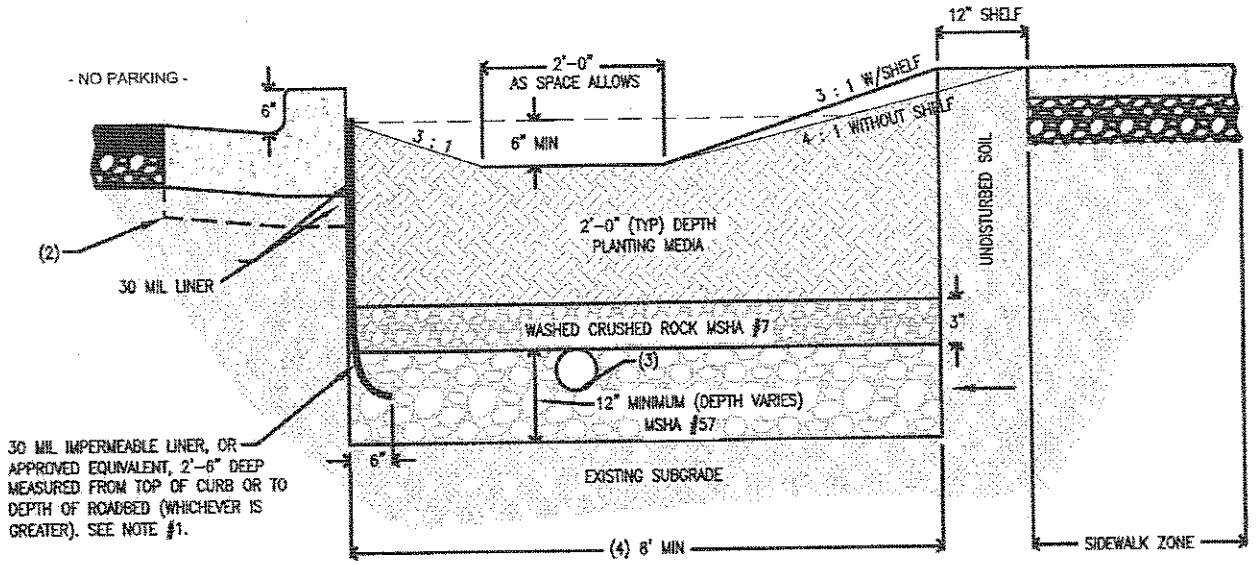
- DRAWING NOT TO SCALE -

RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Swale Plan
(With Check Dams)

NUMBER

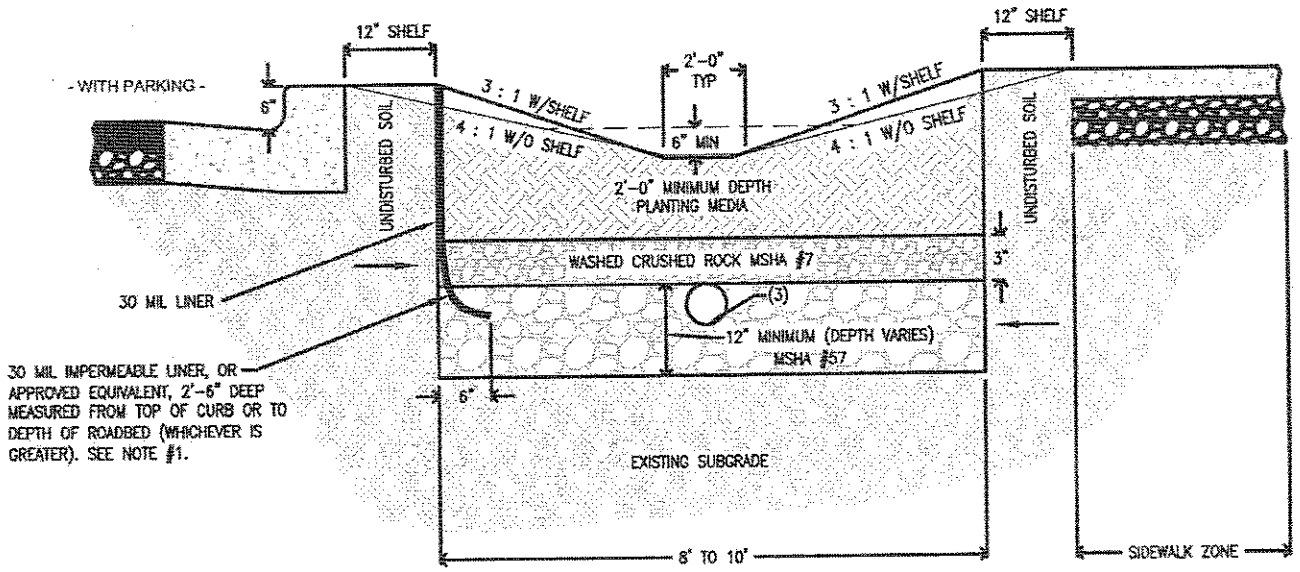
SW-300



SECTION A-A
SWALE WITHOUT PARKING

NOTES:

1. Liner required when face of new curb is < 2ft from adjacent water line or on secondary collectors and higher street classifications. Liner may be required on local streets with transit routes, higher traffic volumes, or when facility is adjacent to travel lane, at the discretion of the Engineer.
2. Per DOT requirements, either leave existing curb in place or replace curb and gutter per MC-100.01 with 12" thick gutter pan.
3. Per plan, provide either 6" dia. Sch 40 PVC underdrain or a 6" deep gravel drain layer (MSHA #57).
4. See plan for dimensions.



SECTION A-A
SWALE WITH PARKING

FOR PLAN VIEW
REFER TO SW-300

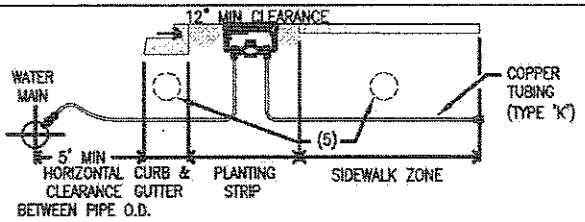
- DRAWING NOT TO SCALE -

RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

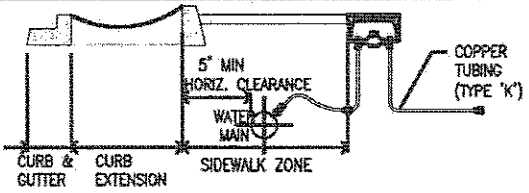
Swale Sections
With and without Parking

NUMBER

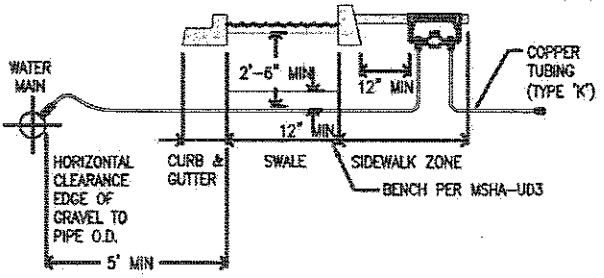
SW-301



SECTION A-A



SECTION B-B



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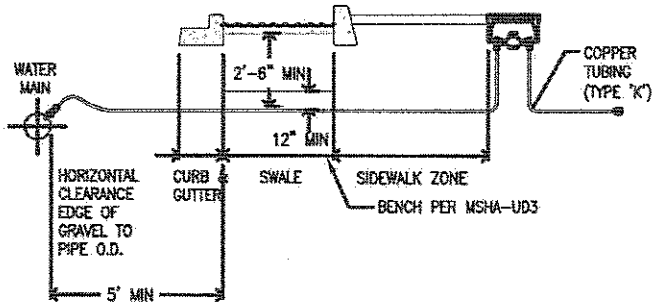
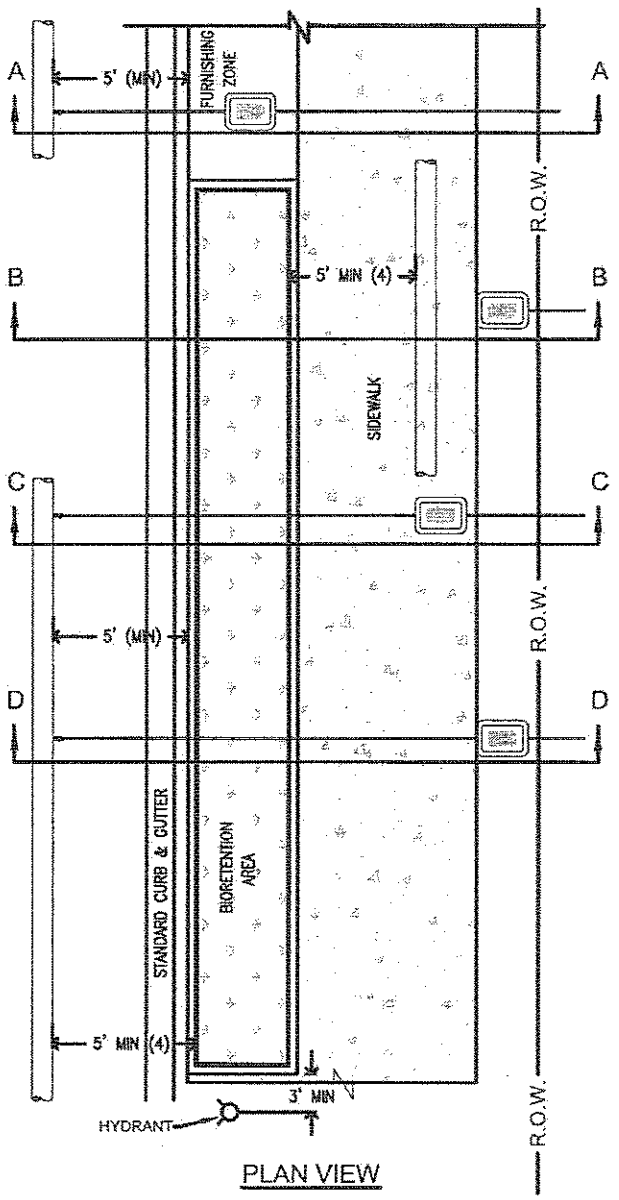


SECTION D-D



PLAN VIEW

NOTES:

1. Refer to fire hydrant installation plan. Hydrants must have 5' min. clearance from the edge of stormwater facility.
2. Standard meter location is A or D. Option B or D can be used only if the meter box is fully within the Right-of-Way. Option C can only be used where the meter box cannot be placed behind the sidewalk, within the Right-of-Way.
3. Water service line must be 2'-6" min below lowest point of ground surface of stormwater facility, typical.
4. Increase to 10 ft. for large diameter water mains with steel or PCCP pipe.
5. Either return flows to gutter, or connect cell underdrains with solid 6" dia. PVC.

- DRAWING NOT TO SCALE -

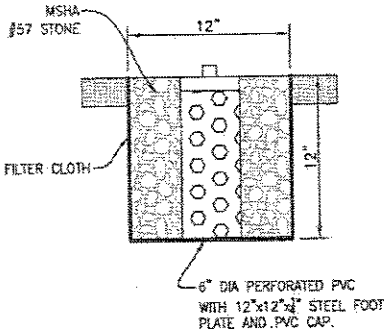
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Clearances and Crossings:

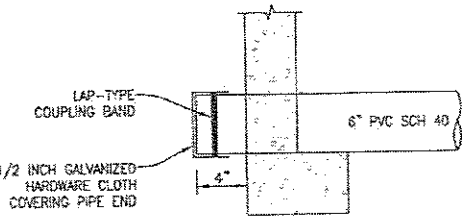
Shallow water, gas or electric utilities

NUMBER

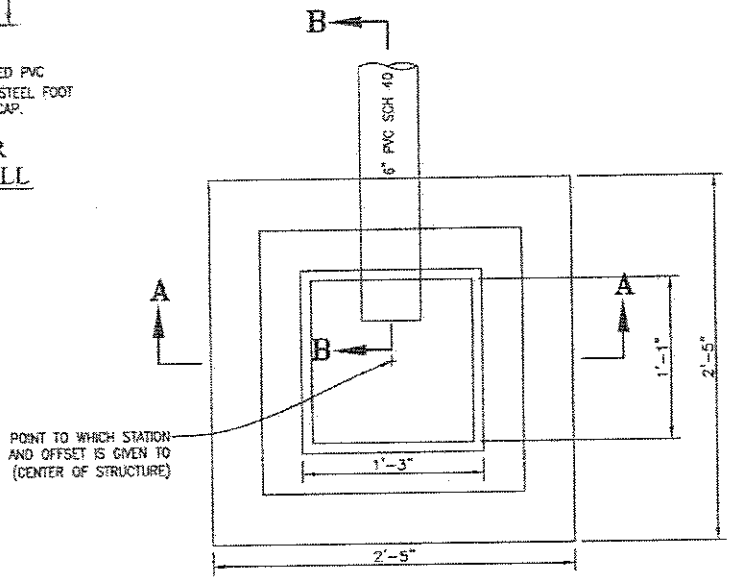
SW-302



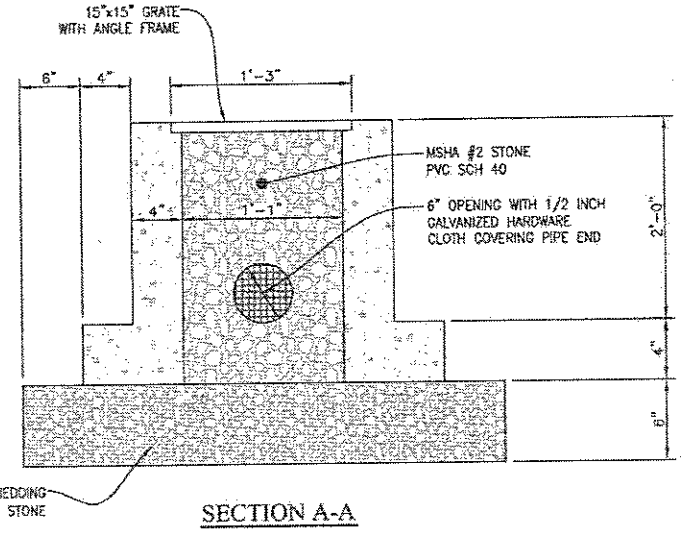
SURFACE WATER OBSERVATION WELL



SECTION B-B



PLAN - GRATE REMOVED



SECTION A-A

NOTES:
1. 15"x15" GRATE WITH ANGLE FRAME SHALL BE CAST IRON, LIGHT DUTY (NEENAH R-4550 / R-4899 OR APPROVED EQUAL).
2. FOR CAST-IN-PLACE STRUCTURE, USE MIX NO.2 CONCRETE FOR PRECAST STRUCTURE, USE MIX NO.6 CONCRETE.
3. REINFORCING SHALL BE NO.4 DEFORMED BARS SPACED 6" C-C.
4. CONTRACTOR SHALL BACKFILL OUTLET WITH NO.2 AGGREGATE CAREFULLY SO THAT EXPOSED PVC AND HARDWARE CLOTH COVERING PIPE OPENING IS NOT DAMAGED.

DRAIN-TO-SURFACE OUTLET

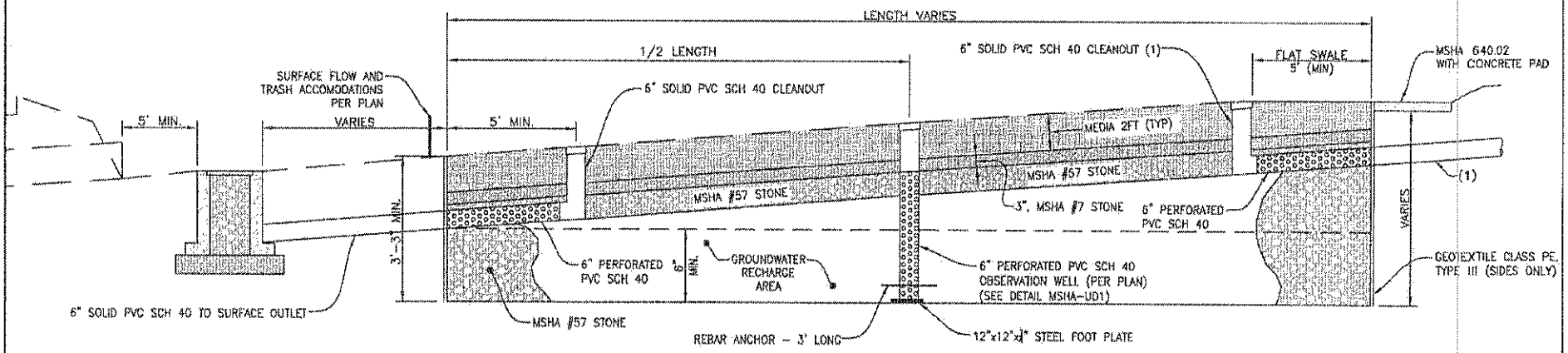
- DRAWING NOT TO SCALE -

RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

DRAIN-TO-SURFACE - OUTLET

NUMBER

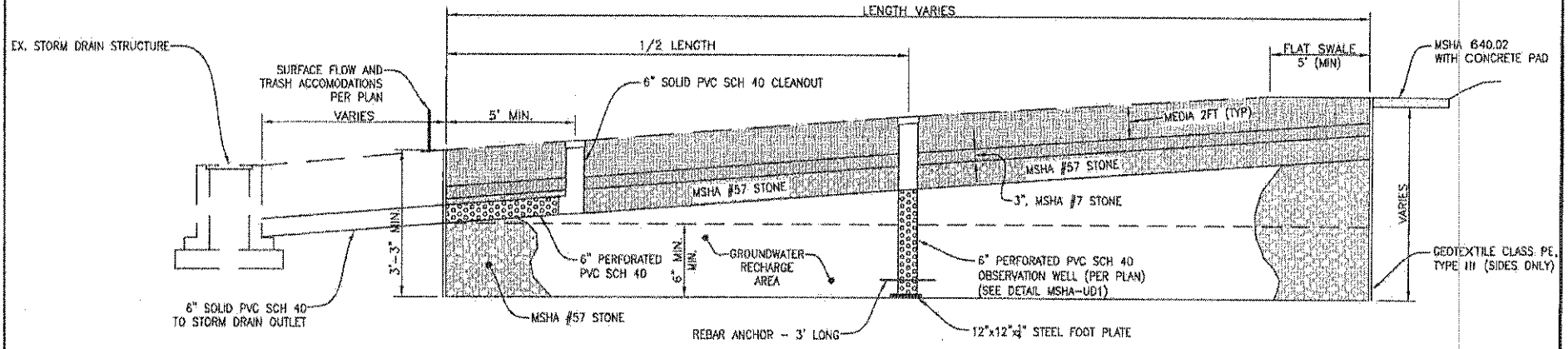
MSHA-UD1



DRAIN TO SURFACE OUTLET
(SEE DETAIL MSHA-UD1)

TYPICAL PROFILE - INTERNAL STORAGE (IN SERIES)

NOTES:
1. ALTERNATIVE 6" MSHA #57 GRAVEL DRAIN LAYER (PER MSHA-UD3 UNDER FILTER CLOTH) AS REQUIRED PER PLAN.



- DRAWING NOT TO SCALE -

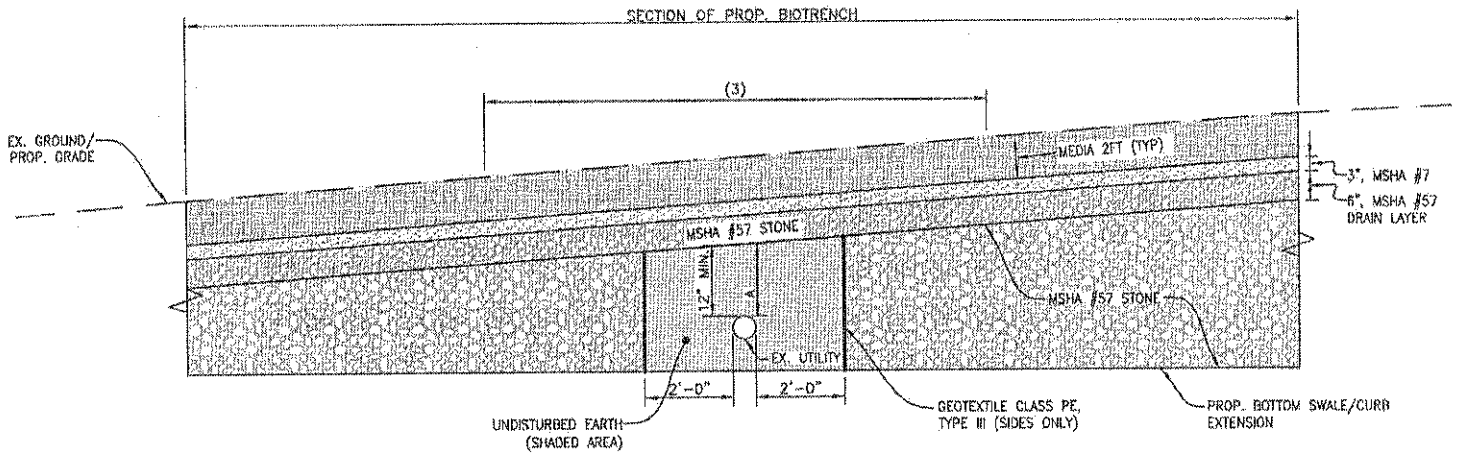
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS

DRAFT 11-__-2009

SLOPED SWALES - TYPICAL PROFILE
(Without Checkdams)

NUMBER

MSHA-UD2



TYPICAL UTILITY CROSSING TREATMENT

NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL FIELD LOCATE ALL EXISTING UTILITIES AND SHALL HAND DIG AROUND UTILITIES LOCATED IN THE VICINITY OF THE PROPOSED EXCAVATION. CONTACT MISS UTILITY 48 HOURS PRIOR TO DIGGING TO HAVE UTILITIES LOCATED.

2. WHEN THE CONTRACTOR ENCOUNTERS AN EXISTING UTILITY WITH LESS THAN 12" OF VERTICAL CLEARANCE BETWEEN THE TOP OF UTILITY AND THE BOTTOM OF BIOTRENCH, THE TYPICAL UTILITY CROSSING TREATMENT SHALL BE FOLLOWED.

3. WHEN THE VERTICAL CLEARANCE BETWEEN THE TOP OF UTILITY AND THE BOTTOM OF THE NO.57 DRAIN LAYER (SHOWN AS DIMENSION A) IS LESS THAN 12", ADJUST MEDIA DEPTH AND CHANNEL SLOPE TO OBTAIN THE REQUIRED COVER DEPTH.

4. UNDISTURBED EARTH AREA SURROUNDING EXISTING UTILITY SHALL EXTEND ACROSS ENTIRE TRENCH WIDTH.

- DRAWING NOT TO SCALE -

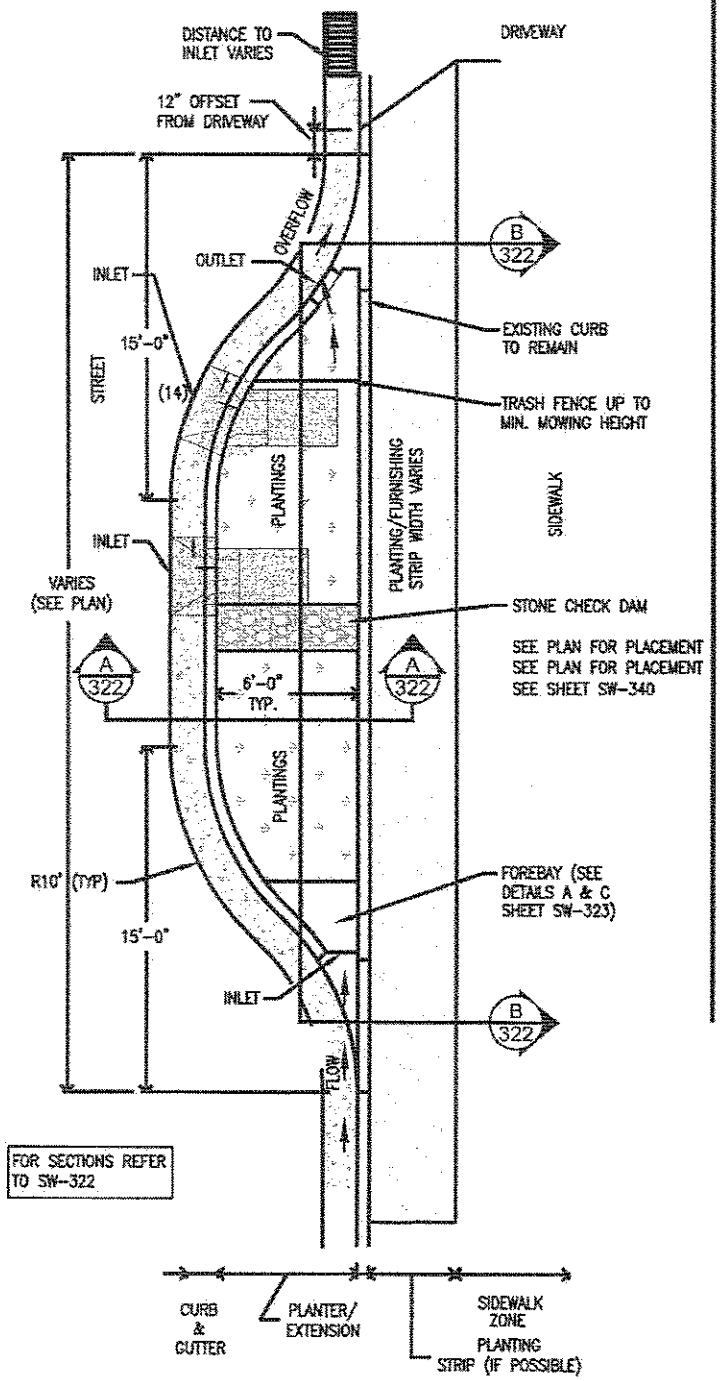
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS

DRAFT 11-__-2009

TYPICAL UTILITY CROSSING

NUMBER

MSHA-UD3



CURB EXTENSION PLAN

NOTES:

1. Width of curb extension to be six (6) feet typical from inside face of curbs. Depth of curb extension to be six (6) inches (min.) from inlet at gutter pan to bottom of facility.
2. Longitudinal slope of planter should match road grade with a preference toward 0% longitudinal (3% maximum). NM cross slope of soil within planter to be 0%.
3. Check dams required to make up grade: See Sheet SW-340 for detail.
4. Special requirements may be necessary on steep slopes and for facilities designed to include discharge.
5. Include beginning and ending station elevations for each facility. Provide the top and bottom elevation at each station called out for each facility. Include elevations of inlets and outlets.
6. Sidewalk elevation must be set above inlet and outlet elevations to allow overflow to drain to street rather than sidewalk.
7. See Sheet SW-323 for inlet/outlet details.
8. See MCDPS Biofiltraton Facility Specifications for Planting Media specifications.
9. Special requirements for water lines, meters, and fire hydrants: See site plan, SW-302, SW-324 or MSHA-UD3 for details.
10. Depending on conditions, utility lines may need to be sleeved.
11. Use standard MC-100.01 with gutter thickened to 12".
12. Where feasible, width of facility may extend into existing planting strip (remove the existing curb in this case).
13. IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate existing utilities prior to beginning design.
14. If slope and length allow, add an inlet per SW-330 near donwstream end with at least 2" drop available between gutter and swale elevations.

- DRAWING NOT TO SCALE -

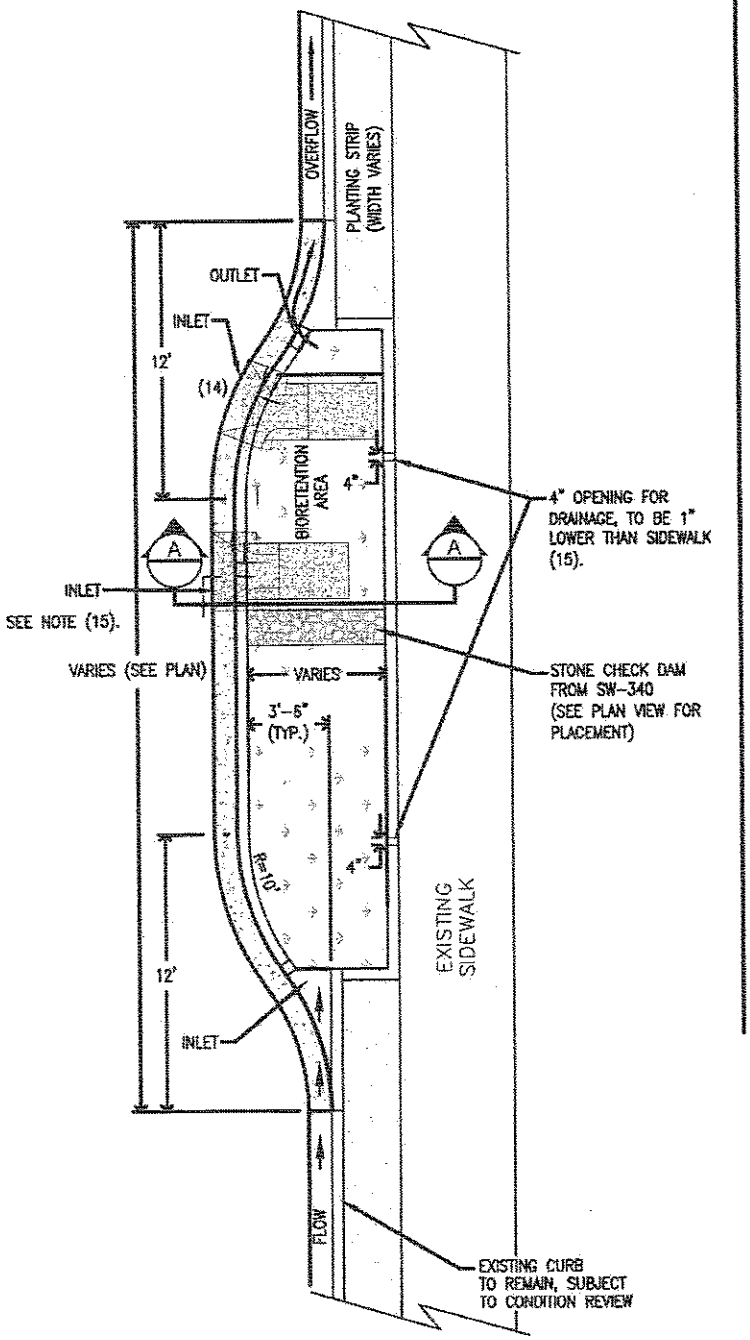
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Curb Extension

In-Street Plan

NUMBER

SW-320



CURB EXTENSION PLAN

NOTES:

1. Width of curb extension to be six (6) feet typical from inside face of curbs. Depth of curb extension to be six (6) inches (min.) from inlet at gutter pan to bottom of facility.
2. Longitudinal slope of planter should match road grade with a preference toward 0% longitudinal (3% maximum). NM cross slope of soil within planter to be 0%. Special requirements may be necessary on steep slopes and for facilities design to include discharge.
3. Check dams required to make up grade: See Sheet SW-340 for detail.
4. Special requirements may be necessary on steep slopes and for facilities designed to include discharge.
5. Include beginning and ending station elevations for each facility. Provide the top and bottom elevation at each station called out for each facility. Include elevations of inlets and outlets.
6. Sidewalk elevation must be set above inlet and outlet elevations to allow overflow to drain to street rather than sidewalk.
7. See Sheet SW-323 for inlet/outlet details.
8. See MCDPS Biofiltraton Facility Specifications for Planting Media specifications.
9. Special requirements for water lines, meters, and fire hydrants: See site plan, sheet SW-302, SW-324 or MSHA-UD3 for details.
10. Depending on conditions, utility lines may need to be sleeved.
11. Use standard MC-100.01 with gutter thickened to 12".
12. Where feasible, width of facility may extend into existing planting strip (remove the existing curb in this case).
13. IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate existing utilities prior to beginning design.
14. If slope and length allow, add an inlet near donwstream end with at least 2" drop available between gutter and swale elevations.
15. Use standard section per SW-301 or SW-322 as instructed per plan.

- DRAWING NOT TO SCALE -

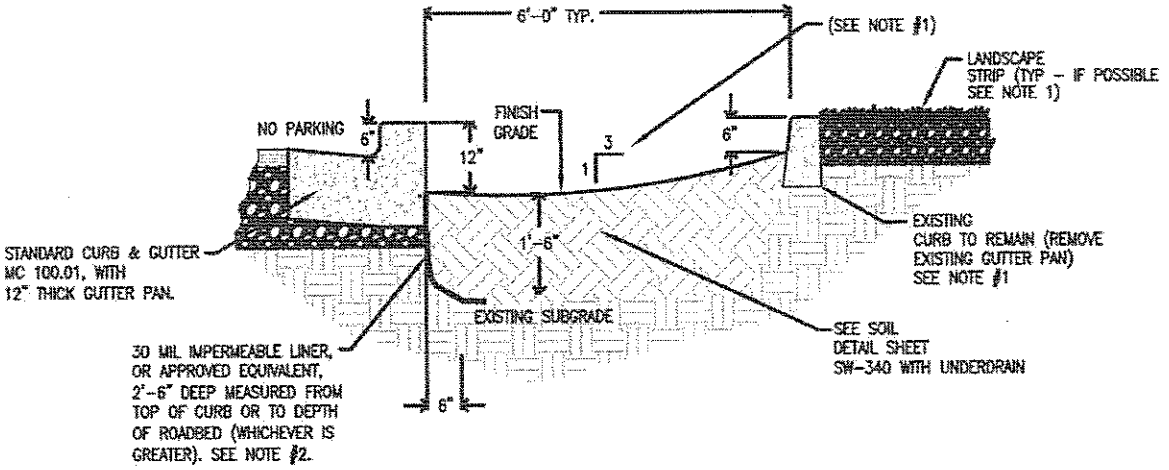
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Curb Extension

In-Planter Plan

NUMBER

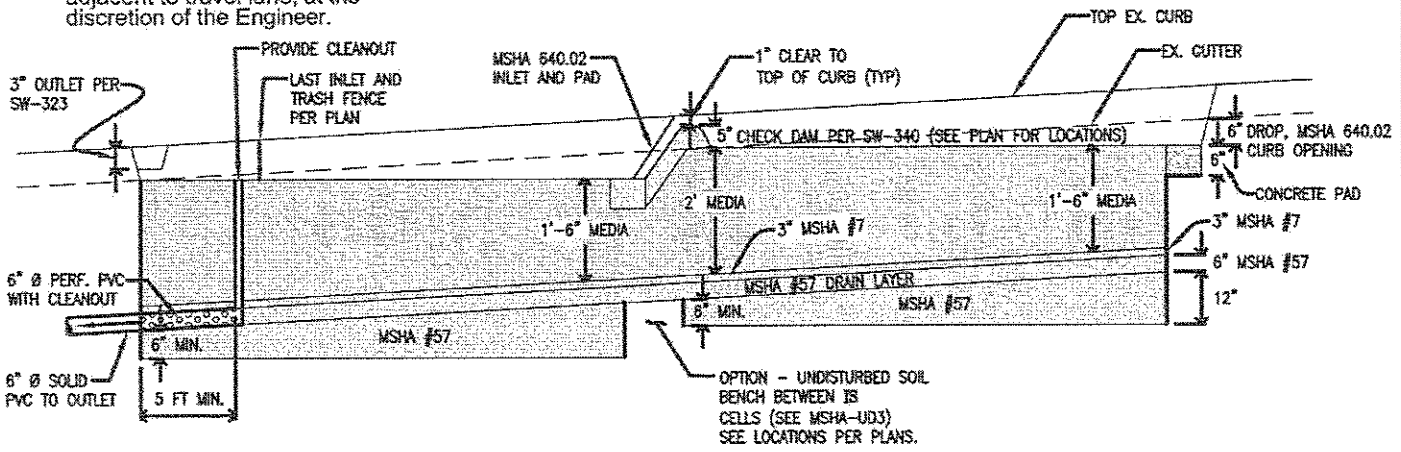
SW-321



SECTION A-A
CURB EXTENSION SECTION

NOTE:

1. If stormwater curb extension is constructed next to an existing sidewalk, soil elevation must be brought to top of curb and slope away from curb at a 1 foot bench and 3:1 slope as per SW-301.
2. Liner required when face of new curb is less than 2 feet from adjacent water line or on neighborhood collectors and higher street classifications. Liner may be required on local streets with transit routes, higher traffic volumes, or when facility is adjacent to travel lane, at the discretion of the Engineer.



SECTION B-B
TYPICAL PROFILE (WITH CHECK DAMS)

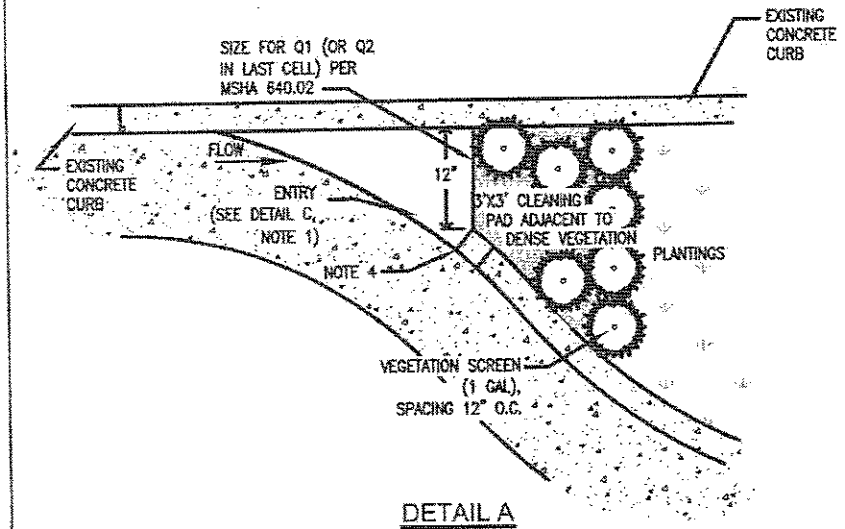
- DRAWING NOT TO SCALE -

RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

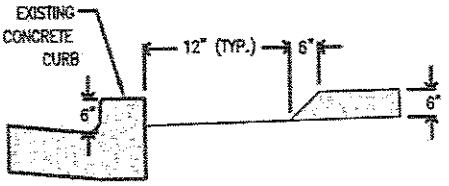
Curb Extension Section and Profile (With Check Dams)

NUMBER

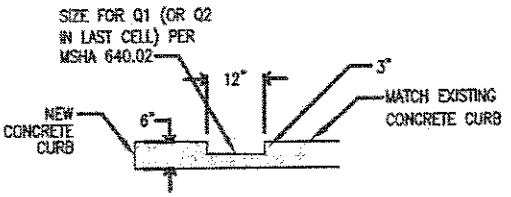
SW-322



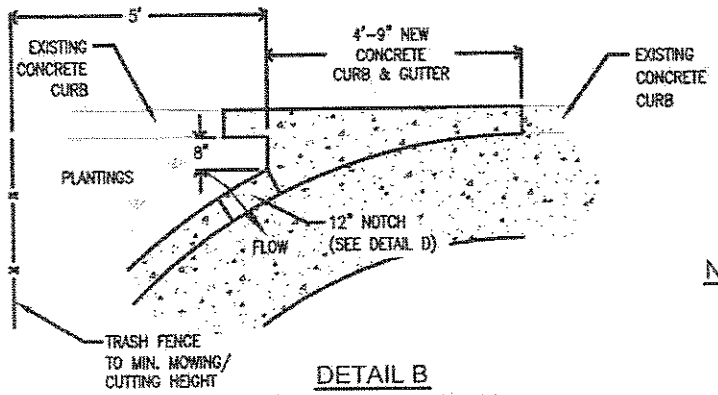
DETAIL A
FOREBAY



DETAIL C
MODIFIED INLET



DETAIL D
MODIFIED OUTLET



DETAIL B
OUTLET CURB PLAN

NOTES:

1. Detail A: Concrete cleaning pad for use with all stormwater curb extensions.
2. Detail C: To prevent ponding, position inlet closer to existing curb if the street cross-slope is >2%. Additional inlets can be added if necessary (preferably immediately downstream of each check dam to minimize potential backflow). Additional inlets are not recommended for streets sloped <1%.
3. Details B, C & D: For use on tertiary streets only.
4. Inlet may be modified to maximize flow entry to stormwater facility.

- DRAWING NOT TO SCALE -

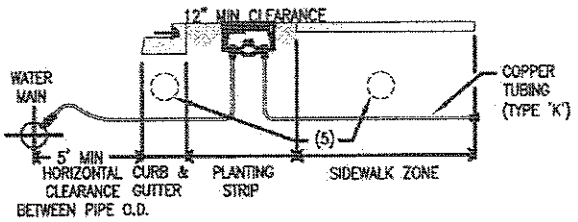
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Curb Extension

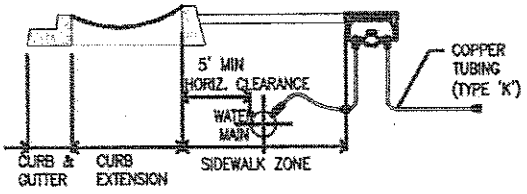
Inlet / Outlet Details

NUMBER

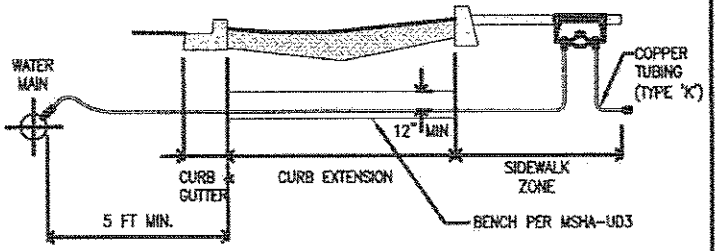
SW-323



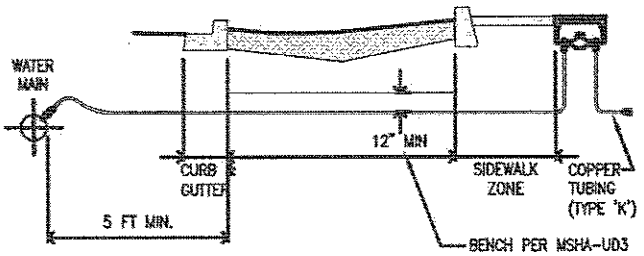
SECTION A-A



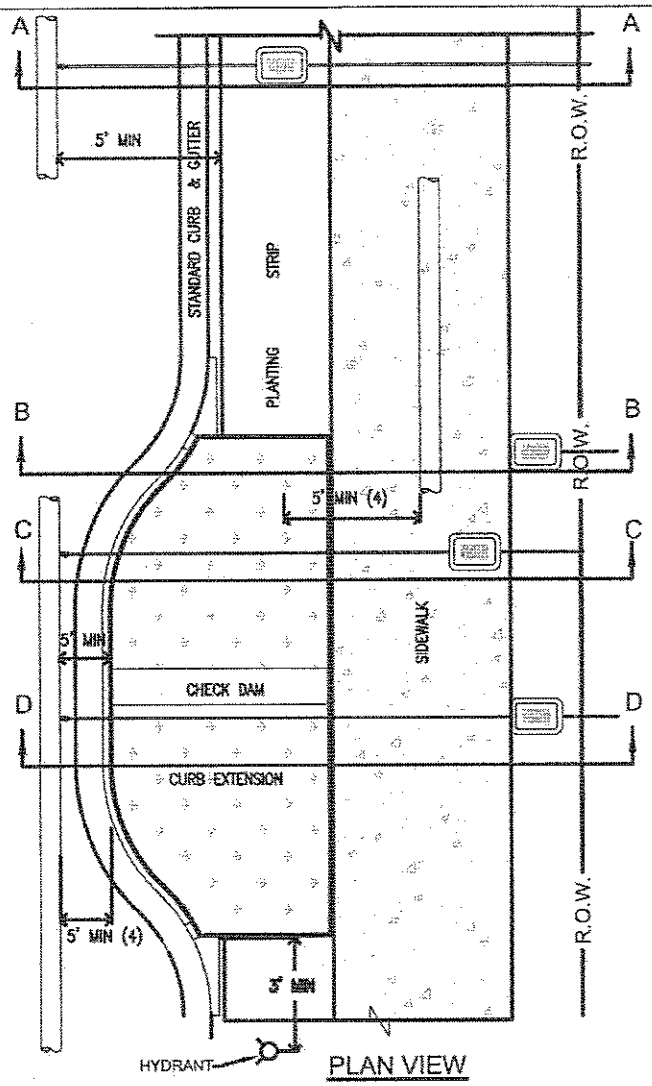
SECTION B-B



SECTION C-C



SECTION D-D



PLAN VIEW

NOTES:

1. Refer to fire hydrant installation plan. Fire hydrants must have min clearance from the edge of a stormwater facility.
2. Standard meter location is A or D. Option B or D can be used only if the meter box is fully within the Right-of-Way. Option C can only be used where the meter box cannot be placed behind the sidewalk within the Right-of-Way.
3. Water service line must be 2'-6" min below lowest point of ground surface of stormwater facility, typical.
5. Either return flows to gutter, or connect cell underdrains with solid 6" dia. PVC.

NOTES (cont):

4. Increase to 10 ft. for large diameter water mains with steel or PCCP pipe.

- DRAWING NOT TO SCALE -

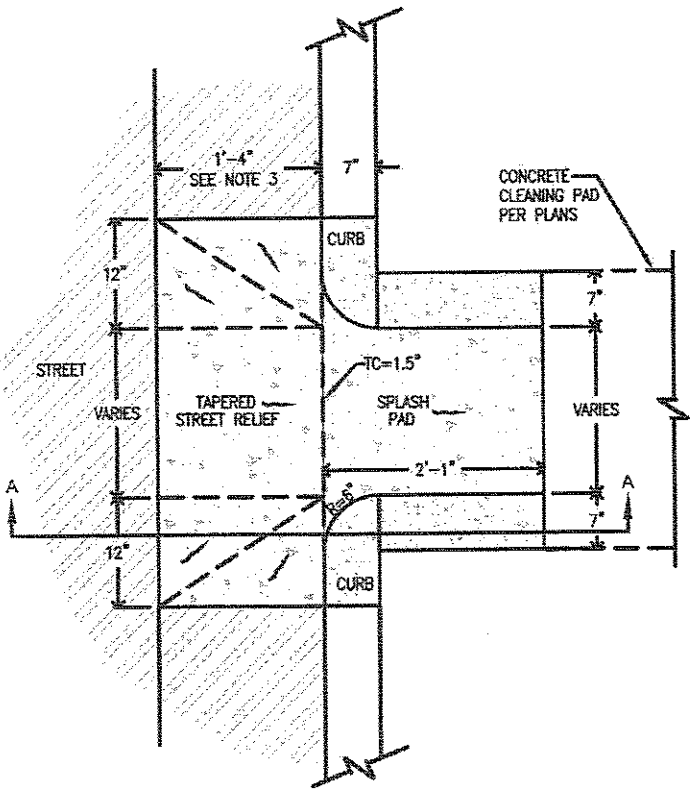
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Curb Extension

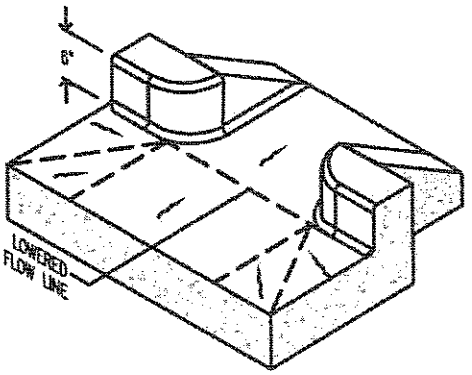
Meter & Hydrant Locations

NUMBER

SW-324



PLAN

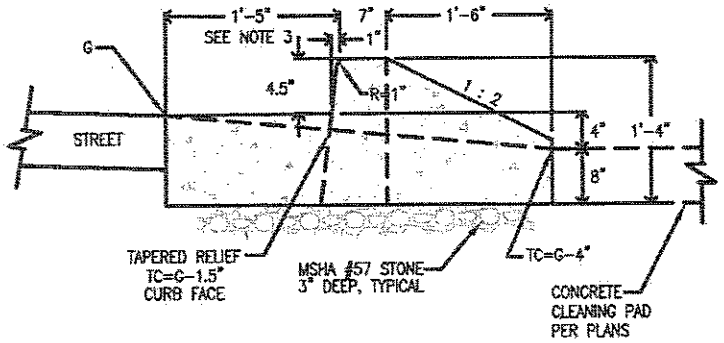


ISOMETRIC

NOTES:

1. Concrete splash pad necessary where water enters and/or exits facility.
2. For stormwater facilities, install washed pea gravel or river rock to transition from splash pad to topsoil.
3. Reference standard MC-100.01.

* Typically will use MSHA 640.02 sized for Q1 (upstream Cells) and Q2 (last cell with trash fence)



TC = TOP OF CONCRETE
G = EDGE OF GUTTER (AT STREET)

SECTION A-A

- DRAWING NOT TO SCALE -

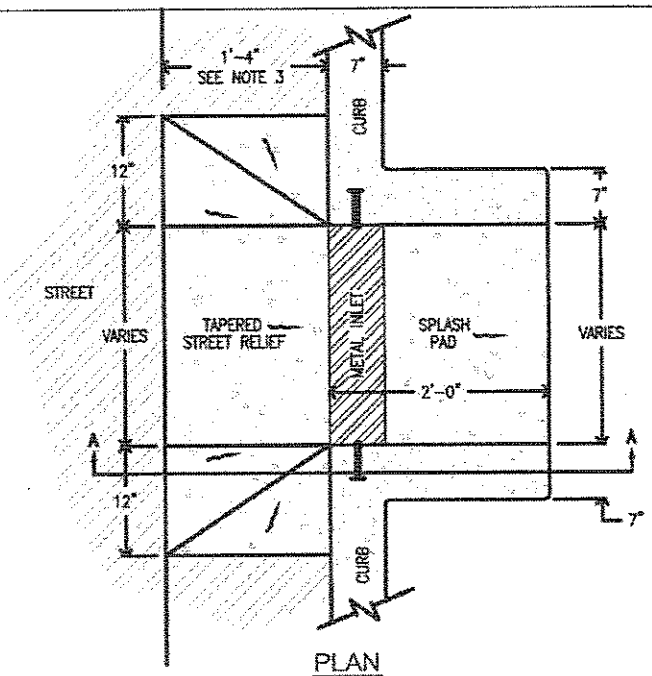
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Concrete Inlet, Type SW

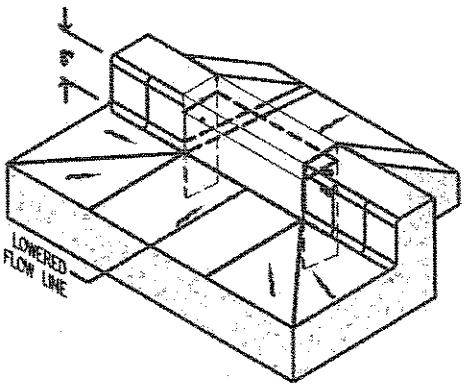
For Tertiary Roads

NUMBER

SW-330



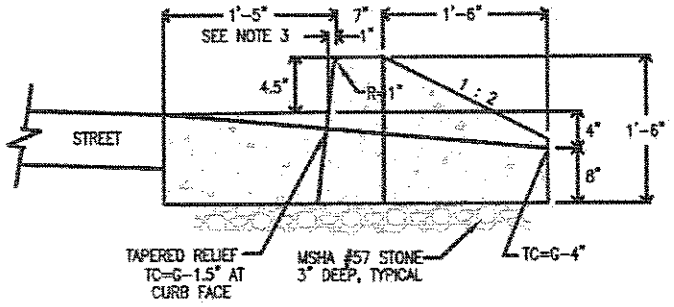
PLAN



ISOMETRIC

NOTES:

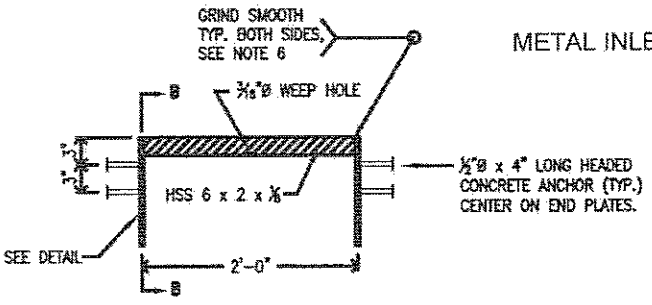
1. Headed concrete anchors shall meet the requirements of ASTM A-108.
2. HSS 6 x 2 x 1/8 shall meet the requirements of ASTM A-500 Grade B.
3. End Plates shall meet the requirements of ASTM A-36.
4. Entire assembly shall be Hot-Dip Galvanized in accordance with ASTM A-123.
5. Design vertical wheel load is 8.5kips (1/2 of tandem axle weight specified in FHWA-HOP-06-105).
6. Single Bevel Groove Weld.



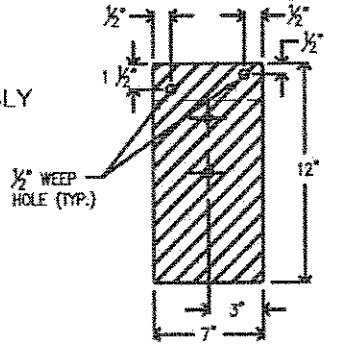
TC = TOP OF CONCRETE
G = EDGE OF GUTTER

SECTION A-A

METAL INLET ASSEMBLY



ELEVATION



SECTION B-B
END PLATE DETAIL

NOTE: ADJUST AS NECESSARY
IF NEEDED WITH MSHA 640.02

- DRAWING NOT TO SCALE -

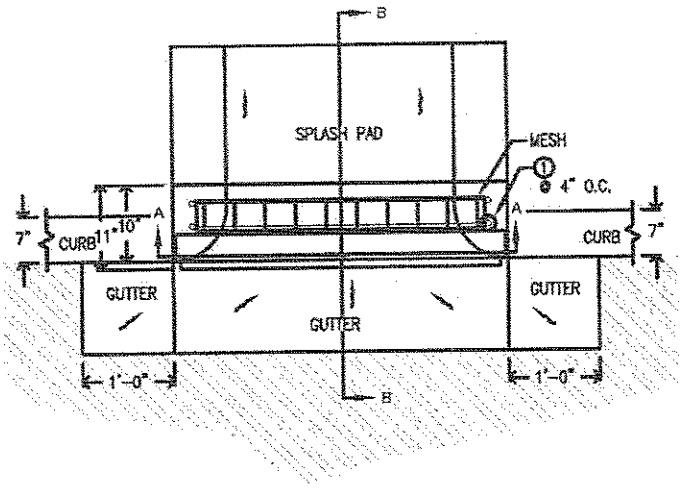
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Concrete Inlet, Type PB (Metal)

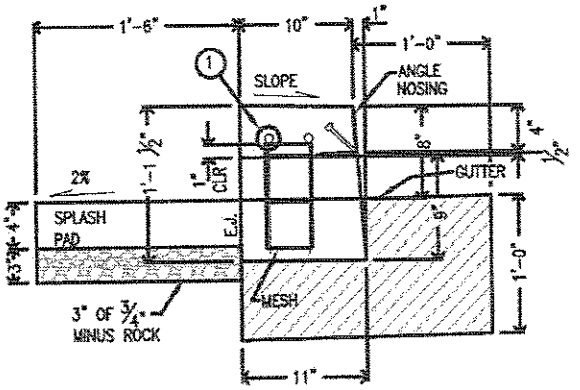
For Secondary Roads and Above

NUMBER

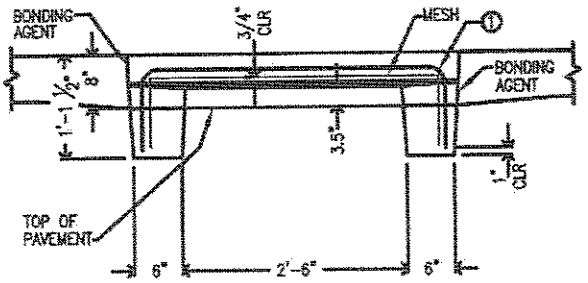
SW-331



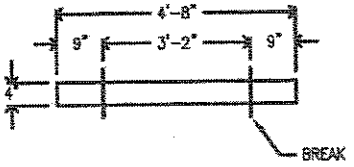
PLAN



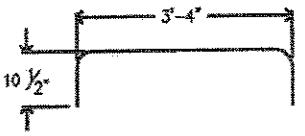
SECTION B-B



SECTION A-A



DETAIL MESH



DETAIL 1

E.J. = EXPANSION JOINT
CLR. = CLEAR
O.C. = ON CENTER

STRUCTURAL NOTES:

1. Concrete: 28 Day Strength f'c = 4,000 PSI.
2. Rebar: ASTM A-615 Grade 60.
3. Mesh: ASTM A-185 Grade 65.
4. Design: ACI-318 Building Code, ASTM C-857 "Min structural design loading for underground precast concrete utility structures".
5. Loads: H-20 truck wheel w/ 30% impact.

BILL OF MATERIAL

PART	DESCRIPTION	QTY.	SIZE	TOTAL WT. LBS.
	ANGLE NOSING	1	3.5"x3.5"x3'-7" GALV.	
MESH	W2.9/W2.9 4x4	1	SEE DETAIL MESH	2 SF
①	#6 GR 60	2	SEE DETAIL 1	15

NOTE: ADJUST AS NECESSARY IF NEEDED WITH MSHA 640.02

- DRAWING NOT TO SCALE -

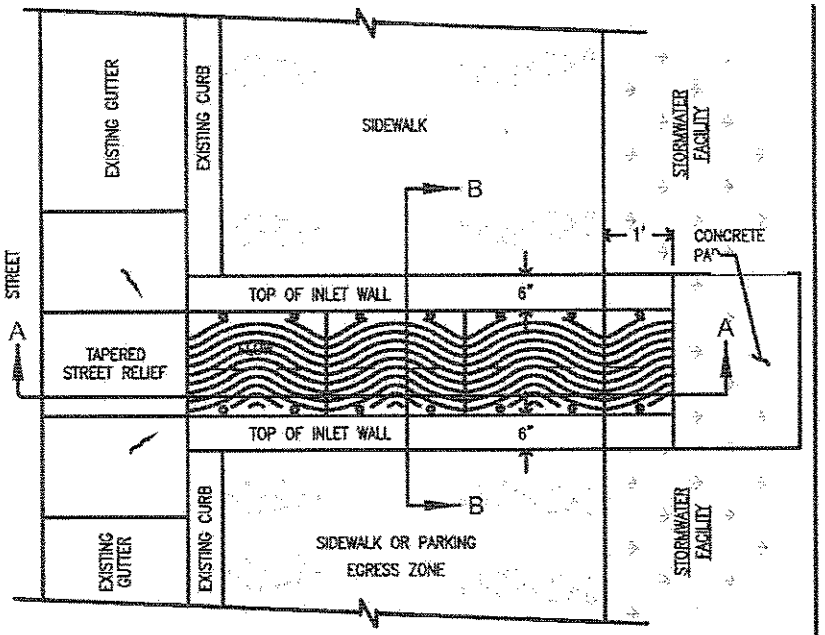
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Concrete Inlet, Type PB

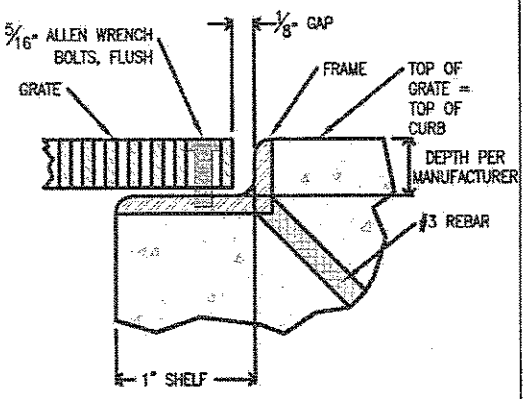
For Secondary Roads and Above

NUMBER

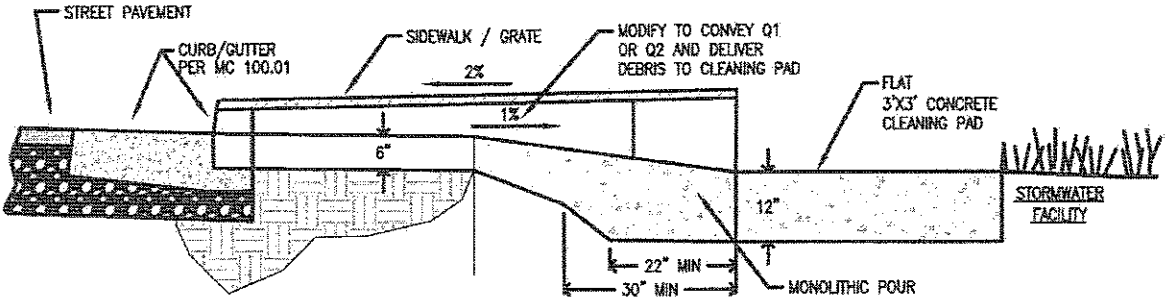
SW-332



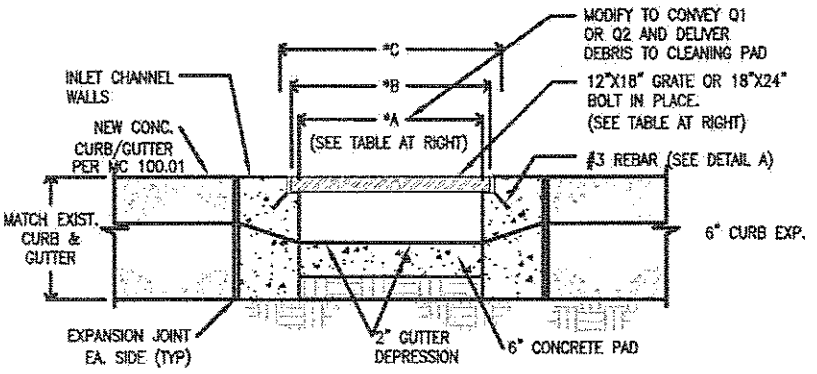
PLAN VIEW



DETAIL A



SECTION A-A



SECTION B-B

*TRENCH GRATING

A TRENCH WIDTH	B GRATE WIDTH	C FRAME WIDTH
10"	11 7/8"	12 1/8"
16"	17 7/8"	18 1/8"

NOTE: MAXIMUM GRATE HOLE WIDTH (OPEN) 1/4 INCH. GRATE SIZE 12"X18" OR 18"X24". CAST IRON URBAN ACCESSORIES TRENCH GRATE AND FRAME. TITLE WAVE MODEL OR EQUAL.

- DRAWING NOT TO SCALE -

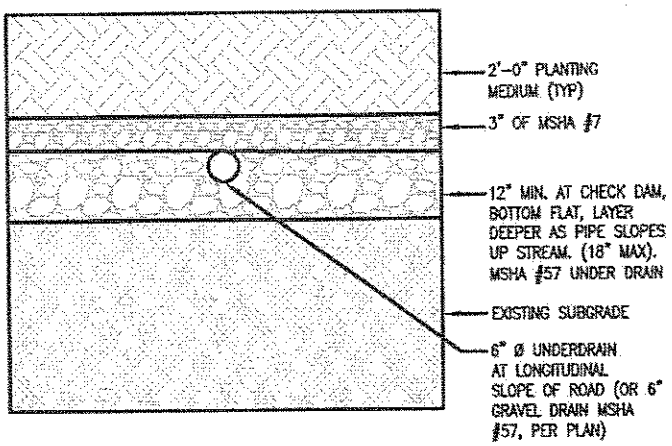
RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Concrete Inlet

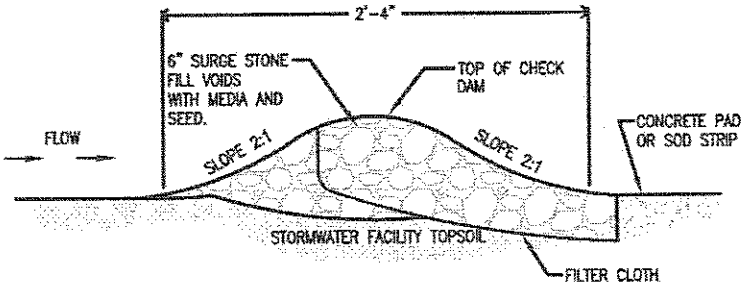
Type Channel & Grate

NUMBER

SW-333



SOIL PROFILE



CHECK DAM

CHECK DAM SPACING

Facility Length	Longitudinal Street Slope	# of Check Dams *	Additional Inlets **
30	<=1%	0	None
	>1%	1	None
31 - 50	<=1%	1	None
	>1%	2	1
51 - 70	<=1%	2	1
	>1%	3	2
71-90	<=1%	3	2
	>1%	4	3
91 +	<=1%	4	3
	>1%	5	4

TABLE 1

CHECK DAM NOTES:

1. Check Dams to be evenly spaced to accommodate 0.5ft deep ponding in each cell along the swale.
2. Additional inlets to be placed directly downstream of check dams. All inlets must have 3ft x 3ft concrete cleaning pad. Make adjustments in downstream cell to accommodate Q2 and Trash collection
3. Top of Check Dam to be 1" below gutter elevation at inlet (at curb line) but not greater than 2" below top of curb.

- DRAWING NOT TO SCALE -

RIGHT - OF - WAY SWM RETROFIT TYPICAL DETAILS DRAFT 11-30-2009

Growing Medium Profile and Check Dam

NUMBER

SW-340

NOTES FOR OPENSECTION ROAD RETROFITS

1. Look at shoulder reinforcement per 2007 WA state standard.
2. Add redundancy to folder strips with inlet chides at grade drops.
3. Limit check dams or tall grass to treatment channel, mowed grass along above for high flow conveyance.
4. Need to work out shade planting scheme (especially for sloped channel).

- DRAWING NOT TO SCALE -

DRAFT 11-30-2009

Notes For Opensection Road Retrofits

NUMBER

MCDEP-1